Welcome

Alliance For Education
Linking Learning to Living

Relevance in the Mathematics Classroom

2010 MaTHink Mini Conference
February 27, 2009

Presenter:
Kim Terry - Curriculum Specialist, Mathematics
Alliance for Education
San Bernardino County Superintendent of Schools

Agenda

- Current State
- Teaching Contextually
- What is Relevance?
- Strategies for Relevance
- Developing/Maintaining Relationships With Business/Labor partners
- Closing/Final Thoughts

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ALLIANCE FOR EDUCATION
SAN BERNARDINO COUNTY SCHOOLS

Gary Thomas, Superintendent
Randall Lewis, Lewis Operating Corp.
Larry Sharp. Arrowhead Credit Union

Leslie Rodden, Director, High Education & Workforce Development, Alliance for Education (SBCSS)
Kevin Baker - Business Community Liaison
Kim Terry - Curriculum Specialist, Mathematics
Cherise Sloma, Project Analyst
Crystal Lopez, Office Specialist III
Matil Perez, Office Specialist II

Alliance For Education
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Mission

To produce an educated and skilled community
that provides a qualified workforce
for the continued economic well-being
and improved quality of life
for all residents.

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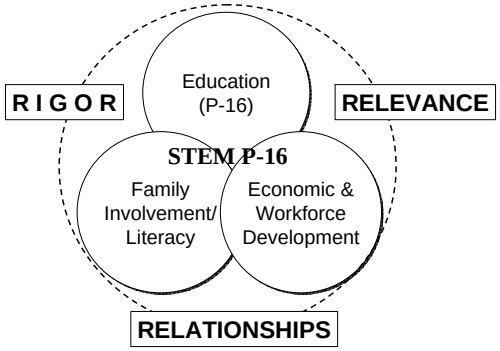
Interdependent System



STEM = Science, Technology, Engineering and Mathematics

How is the Inland Empire doing?

Four-Year Graduation Rates for RIMS Counties and State
Percentages and Relative Rankings (2002-03 to 2006-07)

Graduation Rates

County	02-03	03-04	04-05	05-06	06-07
Inyo	*92.9%*	*93.6%*	*93.6%*	*91.6%*	*86.1%*
Mono	*91.0%*	*96.7%*	*96.8%*	*96.2%*	*77.1%*
Riverside	*88.4%*	*88.5%*	*87.6%*	*84.8%*	*80.5%*
San Bernardino	*85.2%*	*82.8%*	*79.9%*	*77.7%*	*74.5%*
State Total:	***86.7%***	***85.3%***	***85.1%***	***83.4%***	***80.5%***

Relative Rankings
(Highest to Lowest Percentages by Year)

County	02-03	03-04	04-05	05-06	06-07
Inyo	13	12	09	17	20
Mono	25	03	05	03	48
Riverside	38	35	39	43	42
San Bernardino	50	53	54	53	52
State Total:	***n/a***	***n/a***	***n/a***	***n/a***	***n/a***

Graduates Completing All UC / CSU Required Courses
Percentages and Relative Rankings (2002-03 to 2006-07)

Percentage of Graduates

County	02-03	03-04	04-05	05-06	06-07
Inyo	*17.8%*	*13.7%*	*28.0%*	*27.4%*	*24.1%*
Mono	*35.0%*	*60.2%*	*32.2%*	*67.1%*	*0.0%*
Riverside	*30.5%*	*27.7%*	*34.5%*	*28.6%*	*27.4%*
San Bernardino	*21.1%*	*22.9%*	*22.9%*	*24.2%*	*26.0%*
State Total	***33.6%***	***33.8%***	***35.2%***	***36.1%***	***35.5%***

Relative Rankings
(Highest to Lowest Percentages by Year)

County	02-03	03-04	04-05	05-06	06-07
Inyo	54	55	34	34	36
Mono	19	01	24	01	57
Riverside	26	34	21	29	26
San Bernardino	48	45	46	41	31
State Total	***n/a***	***n/a***	***n/a***	***n/a***	***n/a***

Percent of Students Proficient and Advanced in Algebra 1
for the 2007-08, California Standards Tests
RIMS Counties and State

	Inyo	Mono	Riverside	San Bernardino	Statewide
Overall	***14%***	***29%***	***20%***	***19%***	***25%***
Aftrican-American	--	--	14%	13%	**13%**
Asian	--	--	50%	53%	**59%**
Hispanic or Latino	12%	13%	15%	14%	**16%**
White	16%	41%	28%	25%	**36%**
Female	12%	33%	22%	20%	**26%**
Male	15%	23%	19%	18%	**25%**
SES	10%	9%	14%	13%	**17%**
Non-SES	15%	39%	28%	25%	**35%**

Remediation Needs at CSUSB

- Fall 2006 – Entering Freshmen*
  - 70% are first-time college attendees
- Fall 2008– Entering Freshmen**
  - 57.7% in Math
  - 65.4% in English

- *Dr. Karnig convocation 2006: http://www.csusbalumni.com/cgi-any/newspages.dll/pages?htmlfile=newspages3_alumni.htm&record=769
- **http://www.asd.calstate.edu/remediation/08/Rem_SB_fall2008.htm

Alliance For Education — Student Engagement

Linking Learning to Living

1. Chronic disengagement reportedly afflicts 40% to 60% of secondary students

   (Sedlak, 1986; Steinberg, 1996)

2. Engagement in the classroom leads to achievement and contributes to students social and cognitive development

   (Finn, 1993; Newman, 1992)

3. Students who are engaged with school are more likely to learn, to find the experience rewarding, to graduate, and to pursue higher education

   (Marks, 2000)

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STUDENTS INVOLVED IN THEIR COMMUNITY

- **26% more likely to have received recognition for good grades**
- **20% more likely to rate their chances of going to college as very high**
- **Nearly twice as likely to view themselves as worthy persons**
- **13% more likely to believe that they would have a job that they enjoyed**
- **More than twice as likely to feel they had control over their lives**
- **More than two and one-half times more likely to express a sense of civic responsibility and a desire to give back to their community**

Are you teaching contextually?

On a scale from 1-5 rate yourself on the following questions

Taken from *Teaching Mathematics Contextually: The Cornerstone of Tech Prep*, published by CORD Communications, Inc, 1999

1. Are new concepts presented in real-life (outside the classroom) situations and experiences that are familiar to the student?

Taken from *Teaching Mathematics Contextually: The Cornerstone of Tech Prep*, published by CORD Communications, Inc, 1999

2. Are concepts in examples and student exercises presented in the context of their use?

Taken from *Teaching Mathematics Contextually: The Cornerstone of Tech Prep*, published by CORD Communications, Inc, 1999

3. Are new concepts presented in the context of what the student already knows?

Taken from *Teaching Mathematics Contextually: The Cornerstone of Tech Prep*, published by CORD Communications, Inc, 1999

4. Do examples and student exercises include many real, believable problem-solving situations that students can recognize as being important to their current or possible future lives?

Taken from *Teaching Mathematics Contextually: The Cornerstone of Tech Prep*, published by CORD Communications, Inc, 1999

5. Do examples and student exercises cultivate an attitude that says, “I need to learn this”?

Taken from *Teaching Mathematics Contextually: The Cornerstone of Tech Prep*, published by CORD Communications, Inc, 1999

6. Do students gather and analyze their own data as they are guided in discovery of the important concepts?

Taken from *Teaching Mathematics Contextually: The Cornerstone of Tech Prep*, published by CORD Communications, Inc, 1999

7. Are opportunities presented for students to gather and analyze their own data for enrichment and extension?

Taken from *Teaching Mathematics Contextually: The Cornerstone of Tech Prep*, published by CORD Communications, Inc, 1999

8. Do lessons and activities encourage the student to apply concepts and information in useful contexts, projecting the student into imagined futures (e.g., possible careers) and unfamiliar locations (e.g., workplaces)?

Taken from *Teaching Mathematics Contextually: The Cornerstone of Tech Prep*, published by CORD Communications, Inc, 1999

9. Are students expected to participate regularly in interactive groups where sharing, communicating, and responding to the important concepts and decision making occur?

Taken from *Teaching Mathematics Contextually: The Cornerstone of Tech Prep*, published by CORD Communications, Inc, 1999

10. Do lessons, exercises, and labs improve students’ reading and other communication skills in addition to mathematical reasoning and achievement?

Taken from *Teaching Mathematics Contextually: The Cornerstone of Tech Prep*, published by CORD Communications, Inc, 1999

Are You Teaching Contextually?

1. Are new concepts presented in real-life (outside the classroom) situations and experiences that are familiar to the student?
2. Are concepts in examples and student exercises presented in the context of their use?
3. Are new concepts presented in the context of what the student already knows?
4. Do examples and student exercises include many real, believable problem-solving situations that students can recognize as being important to their current or possible future lives?
5. Do examples and student exercises cultivate an attitude that says, "I need to learn this"?
6. Do students gather and analyze their own data as they are guided in discovery of the important concepts?
7. Are opportunities presented for students to gather and analyze their own data for enrichment and extension?
8. Do lessons and activities encourage the student to apply concepts and information in useful contexts, projecting the student into imagined futures (e.g., possible careers) and unfamiliar locations (e.g., workplaces)?
9. Are students expected to participate regularly in interactive groups where sharing, communicating, and responding to the important concepts and decision making occur?
10. Do lessons, exercises, and labs improve students' reading and other communication skills in addition to mathematical reasoning and achievement?

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- On average how did you do?
- What is contextual learning?

Think-Pair-Share

- Take a look at the "Are You Teaching Contextually?" handout
- (Think) Looking at the questions you scored yourself low on, think of two EASY things you could change or add to your teaching that would raise your score.
- (Pair) Discuss your two with your neighbor.
- (Share) Share one from each.

What is Relevance?

Lezotte on Relevance

- For learning and retention to occur, the content must be meaningful to the learner.

Taken from *Learning for All*, by Lawrence Lezotte, 2004,
(High-Yield Strategy Number Five: Listen to the Brain Researchers)

Lezotte on Relevance

- The learner must see the connections between something they already know and what it is that they are trying to learn.

Taken from *Learning for All*, by Lawrence Lezotte, 2004
(High-Yield Strategy Number Five: Listen to the Brain Researchers)

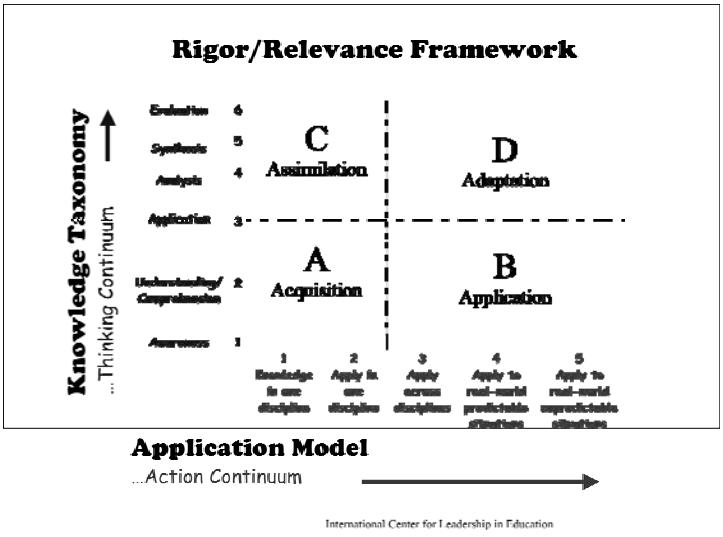
Lezotte on Relevance

- Teachers should always strive to "package" the new learning inside the interests of each student.

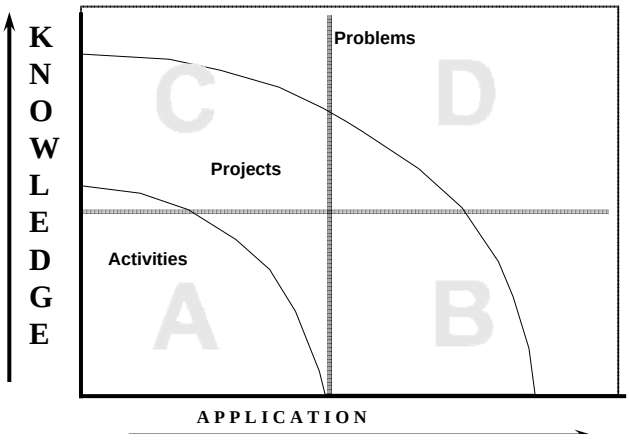
Taken from *Learning for All*, by Lawrence Lezotte, 2004
(High-Yield Strategy Number Five: Listen to the Brain Researchers)

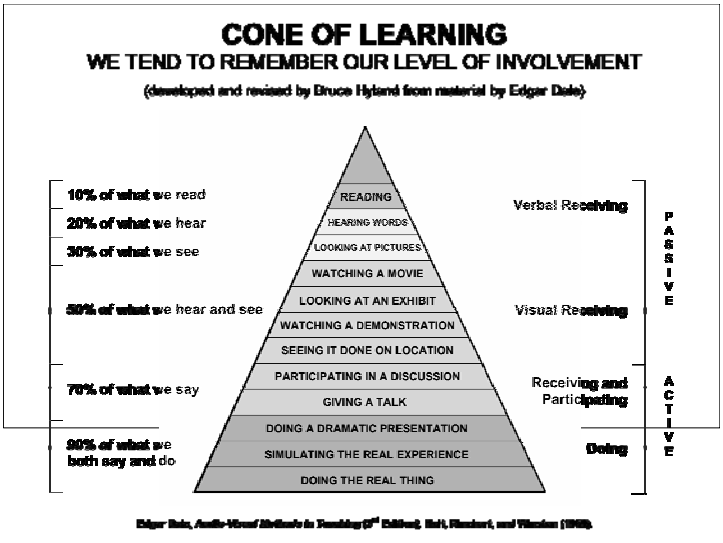
What is relevance?

- Two types of real-world relevance
  - Incidental
  - Authentic



Rigor/Relevance Framework





Let's look at some strategies for bringing relevance into the classroom

Making the Connection

"Making the Connection" Strategies

- Problem/Project-Based Learning
- Field Study*
- Speakers Bureau*

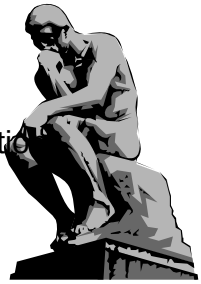
*ABLE

Problem/Project-Based Learning

- Problem/Project-Based Learning is an instructional practice designed to improve achievement by engaging students in using knowledge in thoughtful and deep applications to real world problems or simulations of them….thus gaining deeper understanding

Student Owned Learning Behaviors

- Questioning and brainstorming
- Researching/investigating
- Collecting/analyzing data
- Synthesizing information
- Making decisions for best resolution
- Writing a formal proposal
- Presenting findings and possible resolutions
- Reflecting on the learning process



Advantages of PBL

- Increases motivation
- Shows connections across disciplines
- Promotes critical thinking
- Fosters abilities to organize, plan, and work with others

Problem/Project-Based Learning

PBL can be effectively adapted to a standards-based curriculum. As a bonus, it often connects students to the community.

Research on PBL

Research from medical schools shows that PBL:

- Activates prior knowledge so as to facilitate new learning;
- Transfers easily to real uses of knowledge;
- Increases probability that learner will remember the content.

Thinking Differently About Community Partnerships and Learning

- Parent and community involvement is listed as 1 of 5 school-level factors that educational research indicates as an effective practice.

  Marzano, R. (2003)

- What learners DO determines what and how much is learned, how well it will be remembered, and the conditions under which it will be recalled.

  Halpern D. & Hakel, M. (2003)

- Learning is generally enhanced when learners are required to take information that is presented in one format and "re-represent" it in an alternative format.

  Halpern, D. & Hakel, M. (2003)

- Learning is strongly influenced by emotion.

According to **JOHN DEWEY**

To understand something:

"is to see it in its relation to other things, to note how it operates or functions, what consequences follow from it, and what causes it."

PBL Videos

What is ABLE?

Applications by Business and Labor for Educators

- Demonstrations by partners are **standard aligned**
- Demonstrations follow a **structured format** provided by a template
- Demonstrations are developed through a **step-by-step process**

Speakers' Bureau Video

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Field Study

CSI Field Study Demo

Craig Ogino, Lab Director, Scientific Investigations Unit
Norm Nunez, Sheriff's Community Relations Officer
San Bernardino County Sheriff's Department

Field Study Video

07-08 ABLE Speakers' Bureau Survey Results

- Results indicate that students were engaged and their level of interest was above average.
- Students reported that they came to class more often after attending the presentations
- Science and Math were noted as the students most favorite subjects.

07-08 ABLE Speakers' Bureau Survey Results

- Almost 50% of the students plan to attend college or university after graduation.
- STEM was highly represented when students reported their after high school career choices.
- Results indicate that 1/3 of the students' career choices were influenced by the presenters.

ABLE Demo Example

- The following presentation is aligned to 7th Grade Standard Algebra & Functions 1.2
  - Use the correct order of operations to evaluate algebraic expressions such as $3(2x + 5)^2$.

Fighting Fires with Algebra!

(Friction Loss)

By

San Bernardino City Professional Firefighters

Tom Rubio, Engineer

Introduction

- Background
  - Personal background
  - Organization background
- Interesting facts

PLAY FIREFIGHTER VIDEO HERE

- A short 3-minute video of firefighters in action is shown.

Math in the field

- Rates: like Gallons Per Minute (GPM)
- Pressure calculations
- Titration (dosage)
- Unit conversions
- Estimation

Vocabulary

A Firefighter's "Fightin" Words!

- Friction Loss
- Nozzle Pressure
- Orifice
- PSI
- Total Engine Pressure

A Firefighter's Formula!

In the formula:

$$FL = \left[2\left(\frac{GPM}{100}\right)^2 + \frac{GPM}{100}\right]\left(\frac{L}{100}\right) + NFL$$

Friction Loss Formula

FL = Total Friction Loss
L = length of hose in feet
NFL = PSI of Nozzle
GPM = Gallons per Minute rating of Nozzle orifice

The Friction Loss formula is a basic formula used by firefighter engineers to calculate the PSI setting.

Example

The fire Engine stops at a house fire and the hoseman grabs 300 ft of hose and a 50 psi nozzle with a 200 GPM flow rate orifice. Find the total friction loss so that the gauges can be set

Remember : $FL = \left[2\left(\frac{GPM}{100}\right)^2 + \frac{GPM}{100}\right]\left(\frac{L}{100}\right) + NFL$

$L = 300$
$NFL = 50$
$GPM = 200$

$$FL = \left[2\left(\frac{200}{100}\right)^2 + \frac{200}{100}\right]\left(\frac{300}{100}\right) + 50$$

$$FL = \left[2(2)^2 + 2\right](3) + 50$$
$$FL = \left[2(4) + 2\right](3) + 50$$
$$FL = \left[8 + 2\right](3) + 50$$
$$FL = \left[10\right](3) + 50$$
$$FL = 30 + 50$$
$$FL = 80$$

Answer: ***The gauge on the fire engine for this hoseline must be set at 80 psi to compensate for friction loss.***

Guided Practice

The fire Engine stops at a house fire and the hoseman grabs 200 ft of hose and a 50 psi nozzle with a 300 GPM flow rate orifice. Find the total friction loss so that the gauges can be set

Remember : $FL = \left[2\left(\frac{GPM}{100}\right)^2 + \frac{GPM}{100}\right]\left(\frac{L}{100}\right) + NFL$

$L = 200$
$NFL = 50$
$GPM = 300$

$$FL = \left[2\left(\frac{300}{100}\right)^2 + \frac{300}{100}\right]\left(\frac{200}{100}\right) + 50$$

$$FL = \left[2(3)^2 + 3\right](2) + 50$$
$$FL = \left[2(9) + 3\right](2) + 50$$
$$FL = \left[18 + 3\right](2) + 50$$
$$FL = \left[21\right](2) + 50$$
$$FL = 42 + 50$$
$$FL = 92$$

Answer: ***The gauge on the fire engine for this hoseline must be set at 92 psi to compensate for friction loss.***

Independent Practice

The fire Engine stops at a house fire and the hoseman grabs 100 ft of hose and a 50 psi nozzle with a 100 GPM flow rate orifice. Find the total friction loss so that the gauges can be set

Remember : $FL = \left[2\left(\frac{GPM}{100}\right)^2 + \frac{GPM}{100}\right]\left(\frac{L}{100}\right) + NFL$

$L = 100$

$NFL = 50$

$GPM = 100$

$$FL = \left[2\left(\frac{100}{100}\right)^2 + \frac{100}{100}\right]\left(\frac{100}{100}\right) + 50$$

$$FL = [2(1)^2 + 1](1) + 50$$

$$FL = [2(1) + 1](1) + 50$$

$$FL = [2 + 1](1) + 50$$

$$FL = [3](1) + 50$$

$$FL = 3 + 50$$

$$FL = 53$$

***Answer:* The gauge on the fire engine for this hoseline must be set at 53 psi to compensate for friction loss.**

Hands-on Demo

- Students will go out to fire engine.
- A student will volunteer to hold the hose during pressure changes.
- They will be able to feel the difference in pressure at different PSI's.

Thank You

- Questions?
- Final thoughts
- Comments

Sample Authentic Problems

Sample Problem

(SchoolsFirst)

- Lakeisha has decided she wants to buy a new car.
- The auto loan company says her credit is good but she needs to have a debt-to-income ratio below 50%. If her existing credit payments are $125 a month, her rent is $1,225 and her gross monthly income is $3,000, what is the maximum monthly auto payment allowed?

$$\text{Debt Ratio} \geq \frac{\text{New Payment} + \text{All Existing Credit Payments} + \text{Mortgage or Rent}}{\text{Gross Monthly Income}}$$

$$.50 \geq \frac{\text{New Payment} + \$125 + \$1{,}225}{\$3{,}000}$$

$$.50 \geq \frac{n + \$125 + \$1{,}225}{\$3{,}000}$$

$$.50 \geq \frac{n + \$1{,}350}{\$3{,}000}$$

$$(\$3{,}000)(50) \geq \frac{n + \$1{,}350}{\$3{,}000}(\$3{,}000)$$

$$\$1{,}500 \geq n + \$1{,}350$$

$$-\$1{,}350 \quad -\$1{,}350$$

$$\$150 \geq n$$

Answer: The maximum auto payment allowed is $150.00 a month.

What could she do to get the payment lower?

Sample Problem

(IBEW)

- The Question
  - If Jose is playing his Nintendo Wii (which uses 3 amps) at the same time that his sister is getting ready, what is the maximum amount of power (wattage), at 120 volts, that his sister can use with her curling iron and her hair dryer and still keep the power from being disconnected by the 20 amp breaker?
    - The formula for Amperage is $I = \frac{P}{E}\left(Amperage = \frac{Wattage}{Voltage}\right)$
    - Using this formula and the above information the following inequality can be derived:

$$\text{Game System Amperage} + \frac{Wattage}{Voltage} \leq Total\ Amperage$$

$$3\ amps + \frac{Wattage}{120} \leq 20\ Amps$$

Sample Problem
(R & R Rubber Molding)

- Determine the weight of the material for making an O-ring with the following dimensions and density (specific weight).
  - Diameter (*D*) = 15 ft
  - Cross section (*d*) =2 ft
  - Density = 1.5 lbs/ft
- Remember

$$\text{Volume of Torus (or O - ring)} = \frac{Dd^2\pi^2}{4}$$

$$Density = \frac{Weight}{Volume}$$

Sample Problem

Southwest Materials Handling Co.

A specific conveyor belt application requires that the conveyor belt deliver at 60 feet per minute. If the RPM of the driving pulley is 32, what diameter pulley do I need to use?

Use: $R\left(\frac{d\pi}{12}\right) = F$

RPM=*R*
Diameter of pulley=*d*
Feet per Minute=*F*

$R\left(\frac{d\pi}{12}\right) = F$

$32\text{ rpm}\left(\frac{d\pi}{12}\right) = 60\text{ ft/min}$

$32\left(\frac{d\pi}{12}\right) = 60$

$\frac{32d\pi}{12} = 60$

$(12)\frac{32d\pi}{12} = 60(12)$

$32d\pi = 720$

$\frac{32d\pi}{32} = \frac{720}{32}$

$d\pi = 22.5$

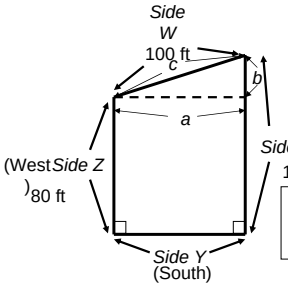
$\frac{d\pi}{\pi} = \frac{22.5}{\pi}$

$d \approx 7.162$

Answer: We need to use a pulley with a 7.162 inch diameter.

SC Surveyors Sample Problem

If *Side W* is 100 ft, *Side X* is 140 ft, and *Side Z* is 80 ft, use Pythagorean Theorem to help find the perimeter of the parcel illustrated below.



Given: *Side W= c, Side Y = a, Side X - Side Z = b*

So, *c*=100 ft and *b*=140-80=60

Remember: $a^2 + b^2 = c^2$

$a^2 + 60^2 = 100^2$

$a^2 + 3{,}600 = 10{,}000$

$-3{,}600 \quad -3{,}600$

$a^2 = 6{,}400$

$\sqrt{a^2} = \sqrt{6{,}400}$

$a = 80$

Since *a* = 80 and *a* = Side *Y*, then Side *Y* = 80, and the perimeter = 100 + 140 + 80 +80

P=240 + 80 + 80

P=320 + 80

P=400 ft

The perimeter of the illustrated parcel is 400 ft.

Kelly Space Sample Problem

A rocket has four rocket engines. The primary rocket engine alone burns the whole tank full of rocket fuel in 30 seconds. The 3 secondary rocket engines together burn the whole tank full of rocket Propellants in about 100 seconds. How long will it take to burn the whole tank full of rocket propellants if they use all the primary and secondary rocket engines together?

$\frac{1\text{ Tank}}{30\text{ sec}}s + \frac{1\text{ Tank}}{100\text{ sec}}s = 1\text{ Tank of Rocket Propellant}$

$30 \bullet 100 = 3{,}000$

$\frac{1}{30}s + \frac{1}{100}s = 1$

$3000\left(\frac{1}{30}s + \frac{1}{100}s\right) = 1(3000)$

$\frac{3000}{30}s + \frac{3000}{100}s = 3000$

$100s + 30s = 3000$

$130s = 3000$

$\frac{130s}{130} = \frac{3000}{130}$

$s = \frac{300}{13}\text{ sec} = 23\frac{1}{13}\text{ sec} \approx 23.08\text{ sec}$

Answer: If the rocket uses all the rockets at the same time it will use the whole tank of rocket Propellant in about 23.08 seconds.

4/2/08

Aviation Example

Art wants to compute the stroke height in a six cylinder engine with a piston displacement of 301.5936 cubic inches. The engine has a bore of 4 inches, a cylinder height of 7inches. What will be the height of the stroke for this engine? (hint: ½ the diameter is the radius)

Using the formula: $p = \pi\left(r^2\right)(h)(c)$

$301.5936 = \pi(2^2)(h)(6)$

$301.5936 = \pi(4)(h)(6)$

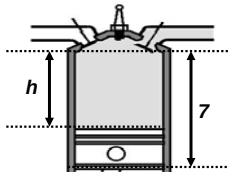
$301.5936 = \pi(24)(h)$

$301.5936 = 3.1416(24)(h)$

$301.5936 = 75.3984(h)$

$\frac{301.5936}{75.3984} = \frac{75.3984(h)}{75.3984}$

$4 \approx h$



Solution: ***The height of the stroke for this engine is approximately 4 inches.***

Other strategies for relevance in the classroom

Web Resources

- Alliance for Education
  - http://www.sbcalliance.org
- CORD (Center for Occupational Research and Development
  - http://www.cord.org/contextual-teaching-and-learning/
- Science of the Olympic Winter Games
  - http://www.lessonopoly.org/svef/?q=node/9086
- No Boundaries
  - http://www.usatoday.com/educate/nasa/index1.html
- The Futures Channel
  - http://www.thefutureschannel.com/hands-on_math.php
- PUMAS
  - https://pumas.gsfc.nasa.gov/

Other Relevance Strategies

- Panels
- Forums

Building Business/Labor Partnerships

Trust - Build Relationships

Respect Their Time

Acknowledge Contributions

Communicate Clearly, Concisely, Considerately & Consistently (The 4 C's)

Keep Perspective and Sense of Humor

Alliance For Education
Linking Learning to Living

Today's education system faces irrelevance unless we bridge the gap between how students live and how they learn.

Learning for the 21st Century

Next Steps

- **Questions?**
- **Final Thoughts**
- **Remember: Just make it REAL for your students!**